AMENDMENTS TO THE CLAIMS

Please cancel claims 1-5 and 7-12:

Claim 13 (New): A turbo decoder having a state metric, comprising:

branch metric calculation means for calculating a branch metric by receiving symbols through an input buffer;

state metric calculation means for calculating a reverse state metric by using the calculated branch metric at said branch metric calculating means, storing the reverse state metric in a memory, calculating a forward state metric; and

log likelihood ratio calculation means for calculating a log likelihood ratio by receiving the forward state metric from said state metric calculation means and reading the reverse state metric saved at a memory in said state metric calculation means,

wherein the log likelihood ratio L_k is calculated by using an equation

$$\overset{2^v-1}{\underset{m-0}{E}}(A_k^{1,m}+B_k^{s(m)})-\overset{2^v-1}{\underset{m-0}{E}}(A_k^{0,m}+B_k^m)$$ wherein m is a state of a trellis diagram; k is a stage;

$s(m)$ is a function a number complemented a Most Significant Bit(MSB)of binary

number of m; $\overset{1}{\underset{j-0}{E}}$ is a function defined as $\overset{1}{\underset{j=0}{E}}A_k^j = A_k^0 E A_k^1 = log_e(e^{A_k^0}+e^{A_k^1})$; j is a $(k-1)^{th}$

input for a reverse state metric; $A_k^{1,m}$ is a kth forward state metric with state m and input

1; $B_k^{s(m)}$ is a kth reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric

with state m and input 0 and B_k^m is a kth reverse state metric with state m.

Claim 14 (New): The turbo decoder in recited as claim 13, wherein said state metric calculation means includes:

reverse state metric calculation means for calculating a reverse state metric in case an input i is 0 according to states of the branch metric; and

forward state metric calculation means for calculating a forward state metric in case an input i is 0 or in case the input i is 1 according to states of the branch metric.

Claim 15 (New):   A calculation method implemented to a turbo decoder, comprising steps of:

a) calculating a branch metric by receiving symbols;

b) calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;

c) calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric;

d) calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and

e) storing the log likelihood ratio,

wherein the log likelihood ratio L_k is calculated by using an equation

$$\mathop{E}_{m-0}^{2^{v}-1} (A_k^{1,m} + B_k^{s(m)}) - \mathop{E}_{m-0}^{2^{v}-1} (A_k^{0,m} + B_k^{m})$$ wherein m is a state of a trellis diagram; $s(m)$ is a

function provides a number complemented a Most Significant Bit (MSB) of binary

number of m; $\mathop{E}_{j-0}^{1}$ is a function defined as $\mathop{E}_{j=0}^{1} A_k^{j} = A_k^{0} \, E \, A_k^{1} = log_e(e^{A_k^{0}} + e^{A_k^{1}})$; j is a $(k-1)^{th}$

input for a reverse state metric; k is a stage; $A_k^{1,m}$ is a kth forward state metric with state

m and input 1; $B_k^{s(m)}$ is a kth reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward

state metric with state m and input 0 and B_k^{m} is a kth reverse state metric with state m.

Claim 16 (New):   The calculation method as recited in claim 15, wherein the

reverse state metric B_k^{m}, which is k^{th} reverse state metric with state m, is calculated by

using an equation $\mathop{E}_{j=0}^{1} (B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)})$, wherein m is a state of a trellis diagram; k is a

stage; j is a $(k-1)^{th}$ input for a reverse state metric; $f(m)$ is the state of $(k+1)^{th}$ stage related

to *the state m of kth* stage; $F(j,m)$ is a function defined as $F(j,m)=f(m)$ for $j=0$ and $F(j,m) =$

$s(f(m))$ for $j=1$; $s(m)$ is a function provides a number complemented for a Most

Significant Bit (MSB) of binary number of m; $\mathop{E}_{j=0}^{1}$ is a function defined as

$$\mathop{E}_{j=0}^{1} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1}); \; B_{k+1}^{F(j,m)}$$ is a $(k+1)^{th}$ reverse state metric with state $F(j,m)$

and $D_{k+1}^{j,f(m)}$ is $(k+1)th$ branch metric with state m and $(k+1)^{th}$ input.

Claim 17 (New): The calculation method as recited in claim 15, wherein the

forward state metric A_k^m, which is k^{th} forward state metric with state m, is calculated by

using an equation $\mathop{E}_{j=0}^{1}(D_k^{j,b(j,m)} + A_{k-1}^{b(j,m)})$ wherein m is a state of a trellis diagram; k is a

stage; $b(j,m)$ is the reverse state of the $(k-1)^{th}$ stage; j is a $(k+1)^{th}$ input for a reverse state

metric; $\mathop{E}_{j=0}^{1}$ is a function defined as $\mathop{E}_{j=0}^{1} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1}); \; A_{k-1}^{b(j,m)}$ is a $(k-1)^{th}$

forward state metric with state $b(j,m)$ and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state $b(j,m)$.

Claim 18 (New):   The calculation method as recited in claim 15, wherein the

reverse state metric B_k^m, which is k^{th} reverse state metric with state m, is calculated by

using an equation $\mathop{2}_{j=0}^{1}(B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)})$, wherein m is a state of a trellis diagram; k is a

stage; j is a $(k-1)^{th}$ input for a reverse state metric; $f(m)$ is a state of $(k+1)^{th}$ stage related to

k^{th} state with state m; $F(j,m)$ is a function defined as $F(j,m)=f(m)$ for $j=0$ and $F(j,m) =$

$s(f(m))$ for $j=1$; $s(m)$ is a function provides a number complemented for a Most

Significant Bit (MSB) of binary number of m; $\mathop{2}_{j=0}^{1}$ is a function defined as

$$\mathop{2}_{j=0}^{1} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + e^{A_k^1}); \; B_{k+1}^{F(j,m)}$$ is a $(k+1)^{th}$ reverse state metric with state $F(j,m)$

and $D_{k+1}^{j,f(m)}$ is $(k+1)th$ branch metric with state m and $(k+1)^{th}$ input.

Claim 19 (New): The calculation method as recited in claim 15, wherein the

forward state metric A_k^m, which is k^{th} forward state metric with state m, is calculated by

using an equation $\sum_{j=0}^{1}(D_k^{j,b(j,m)}+A_{k-1}^{b(j,m)})$ wherein m is a state of a trellis diagram; k is a

stage; $b(j,m)$ is a $(k-1)^{th}$ reverse state; j is a $(k+1)^{th}$ input for a reverse state metric; $\sum_{j=0}^{1}$ is a

function defined as $\sum_{j=0}^{1}A_k^j = A_k^0\, 2\, A_k^1 = log_2(2^{A_k^0}+2^{A_k^1})$; $A_{k-1}^{b(j,m)}$ is a $(k-1)^{th}$ forward state

metric with state $b(j,m)$ and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state $b(j,m)$.

Claim 20 (New): The calculation method as recited in claim 15, wherein the log

likelihood ratio L_k is calculated by using an equation $\sum_{m=0}^{2^v-1}(A_k^{1,m}+B_k^{s(m)})-\sum_{m=0}^{2^v-1}$

$(A_k^{0,m}+B_k^m)$ wherein m is a state of a trellis diagram; k is a stage; $s(m)$ is a function

provides a number complemented for a Most Significant Bit (MSB) of binary number of

m; $\sum_{j=0}^{1}$ is a function defined as $\sum_{j=0}^{1}A_k^j = A_k^0\, 2\, A_k^1 = log_2(2^{A_k^0}+2^{A_k^1})$; $A_k^{1,m}$ is a kth forward state

metric with state m and input 1; j is a $(k-1)^{th}$ input for a reverse state metric; $B_k^{s(m)}$ is a kth

reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric with state m and

input 0 and B_k^m is a kth reverse state metric with state m.

Claim 21 (New):   A computer-readable recording medium storing instructions

for executing a calculation method implemented to a turbo decoder, comprising

functions of:

calculating a branch metric by receiving symbols;

calculating a reverse state metric in case an input i is 0 by using the calculated

branch metric and saving the calculated reverse state metric in a memory;

calculating a forward state metric in case an input i is 0 or in case the input i is 1

by using the calculated branch metric;

calculating a log likelihood ratio by using the forward state metric and the

reverse state metric; and

storing the log likelihood ratio,

wherein the log likelihood ratio L_k is calculated by using an equation

$$\mathop{E}_{m=0}^{2^v-1} (A_k^{1,m} + B_k^{s(m)}) - \mathop{E}_{m=0}^{2^v-1} (A_k^{0,m} + B_k^m)$$ wherein m is a state of a trellis diagram; k is a stage; j

is a $(k-1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of

m with a most significant bit complemented; $\mathop{E}_{j=0}^{1}$ is a function defined as

$$\mathop{E}_{j=0}^{1} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1});$$ $A_k^{1,m}$ is a kth forward state metric with state m and input

1; $B_k^{s(m)}$ is a kth reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric

with state m and input 0 and B_k^m is a kth reverse state metric with state m.

Claim 22 (New): The computer-readable recording medium as recited in claim

21, wherein the log likelihood ratio L_k is calculated by using an equation

$$\mathop{2}_{m=0}^{2^v-1} (A_k^{1,m} + B_k^{s(m)}) - \mathop{2}_{m=0}^{2^v-1} (A_k^{0,m} + B_k^m)$$ wherein m is a state of a trellis diagram; k is a stage; j

is a $(k-1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of

m with a most significant bit complemented; $\mathop{2}_{j=0}^{1}$ is a function defined as

$$\mathop{2}_{j=0}^{1} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + 2^{A_k^1});$$ $A_k^{1,m}$ is a kth forward state metric with state m and input

1; $B_k^{s(m)}$ is a kth reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric

with state m and input 0 and B_k^m is a kth reverse state metric with state m.

Claim 23 (New): The turbo decoder having a state metric as recited in claim 13,

wherein the log likelihood ratio L_k is calculated by using an equation $\mathop{2}_{m=0}^{2^v-1} (A_k^{1,m} + B_k^{s(m)})$

$- \mathop{2}_{m=0}^{2^v-1} (A_k^{0,m} + B_k^m)$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k-1)^{th}$ input

for a reverse state metric; $s(m)$ is a function provides binary number of m with a most

significant bit complemented; $\displaystyle\sum_{j=0}^{1}$ is a function defined as $\displaystyle\sum_{j=0}^{1} A_k^j = A_k^0 \sum A_k^1 = log_2(2^{A_k^0} + 2^{A_k^1})$;

$A_k^{1,m}$ is a kth forward state metric with state m and input 1; $B_k^{s(m)}$ is a kth reverse state

metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric with state m and input 0 and

B_k^m is a kth reverse state metric with state m.